CLAIMS

What we claim is:

1. A method for determining a deployment level of an airbag in a vehicle, the method comprising:

repeatedly capturing depth images of a scene that includes a region of a vehicle seat;

repeatedly determining occupancy information from the captured depth images;

upon occurrence of an event that triggers deployment of the airbag, performing the steps of capturing depth images of the scene and determining occupancy information more rapidly than before when deployment of the airbag is triggered; and

indicating the deployment level of the airbag based at least in part on the occupancy information determined after occurrence of the event.

2. The method of claim 1, wherein determining occupancy information includes determining position information of an occupant on the vehicle seat.

3. The method of claim 1, wherein the step of determining occupancy information includes determining where a designated component of the occupant is in relation to an area from which the airbag is to be deployed.

4. The method of claim 3, wherein the step of determining where a designated component of the occupant is includes determining where at least one of a head or torso of the occupant is in relation to the area from which the airbag is to be deployed.

5. The method of claim 1, further comprising the step of classifying the object from one or more of the captured depth images.

6. The method of claim 5, wherein the step of classifying the object from one or more of the captured depth images is performed before when deployment of the airbag is

triggered.

7. The method of claim 6, wherein the step of classifying the object from one or more of the captured depth images is performed immediately after vehicle start up.

8. The method of claim 1, wherein the step of performing the steps of capturing depth images of the scene and determining occupancy information more rapidly occurs of the order of less than 100 milliseconds.

9. The method of claim 1, wherein the step of performing the steps of capturing depth images of the scene and determining occupancy information more rapidly includes capturing one or more depth images with lower resolution than before occurrence of the event that triggers deployment of the airbag.

10. The method of claim 1, wherein step of indicating the deployment level of the airbag based at least in part on the occupancy information includes lowering the deployment level because the occupant is less than a maximum distance from an area from which the airbag is to be deployed.

11. The method of claim 1, wherein step of indicating the deployment level of the airbag based at least in part on the occupancy information includes maximizing the deployment level because the occupant is a maximum distance from an area from which the airbag is to be deployed.

12. The method of claim 1, wherein the step of determining occupancy information includes determining a pose of the occupant.

13. The method of claim 12, wherein the step of determining a pose of the occupant includes determining whether an extremity of the occupant is extended towards an area from which the airbag is to be deployed.

14. The method of claim 1, wherein step of indicating the deployment level of the airbag based at least in part on the occupancy information includes disabling deployment of the airbag because the occupant is too close from an area from which the airbag is to be deployed.

15. A sensor system for determining a deployment level of an airbag in a vehicle, the sensor system comprising:

a light source that emits light onto a scene that includes a vehicle seat for the airbag;

an array of light-sensitive pixels which capture reflected light from the scene, including reflected light that originated from the light source;

processing resources that determine depth information for an object in the scene based on a time-of-flight characteristic of the reflected light that originates from the light source and is captured on the array, and wherein the processing resources are configured to determine occupancy data for the object based on the captured reflected light from the scene; and

wherein the processing resources are configured to determine the deployment level of the airbag based at least in part on the occupancy data in response to receiving data indicating a collision of the vehicle occurred.

16. The sensor system of claim 15, wherein the processing resources are configured to indicate to another device that actuates the airbag the deployment level of the airbag, in response to the data indicating the collision of the vehicle occurred.

17. The sensor system of claim 15, wherein the light source emits a modulated infrared light source.

18. The sensor system of claim 17, wherein the time-of-flight characteristic includes a phase shift between the modulated light emitted from the light source and the reflected modulated light captured on the array of light-sensitive pixels.

19. The sensor system of claim 15, wherein the array of light-sensitive pixels are part of a complementary metal oxide semiconductor device.

20. The sensor system of claim 15, wherein the processing resources are configured to determine occupancy classification based on reflected light from the light source captured on the array of light-sensitive pixels.

21. The sensor system of claim 20, wherein the occupancy classification includes a first class which accommodates an adult, a second class which accommodates a child or child seat, and a third class which corresponds to no occupant.

22. The sensor system of claim 20, wherein the processing resources are configured to determine occupancy classification based on reflected light from the light source captured on the array of light-sensitive pixels.

23. The sensor system of claim 15, wherein the processing resources are configured to determine occupant position relative to a site from which the airbag is deployed using reflected light from the light source captured on the array of light-sensitive pixels.

24. The sensor system of claim 21, wherein the processing resources are configured to signal data indicating a partial deployment level or zero deployment level based on the occupancy classification in response to the data indicating the collision of the vehicle occurred.

25. The sensor system of claim 23, wherein the processing resources are configured to signal data indicating a partial deployment level or zero deployment level based on the occupancy position in response to the data indicating the collision of the vehicle occurred.

26. The sensor system of claim 23, wherein the processing resources are configured to identify a tracking feature of the occupant in order to track the occupant relative to the site from which the airbag is deployed.

27. The sensor system of claim 23, wherein the processing resources are configured to identify a tracking feature of the occupant based on reflected light from the scene that is captured on the array of light-sensitive pixels.

28. The sensor system of claim 15, further comprising an optical filter for filtering ambient light from reflected light from the scene that is captured on the array of light-sensitive pixels.

29. The sensor system of claim 28, wherein the optical filter is configured to low incidence angles so that the optical filter maintains a relatively narrow interference band.

30. The sensor system of claim 20, further comprising an electrical noise reduction filter to enhance sensitivity of individual pixels in the array.

31. The sensor system of claim 30, further comprising a common more rest that combines with the array of pixels in order to avoid pixel saturation.